

Claims

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- 3 1. An apparatus for routing or switching data packets, including
- 4 a router; and
- 5 an expanded M-trie data structure, said data structure having a set of nodes,
- 6 including a root node, inferior nodes and terminal nodes, wherein each node includes an
- 7 address and an opcode.
- 8
- 9 2. An apparatus as in claim 1, wherein said data structure includes a
- 10 means for performing a lookup based on data included in a data packet.
- 11
- 12 3. An apparatus as in claim 1, wherein said data structure includes a
- 13 means for performing a lookup of data included in a packet header.
- 14
- 15 4. An apparatus as in claim 1, wherein said data structure includes a
- 16 means for performing a lookup of data included in an IP packet header.
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- 18
- 19 5. An apparatus as in claim 1, wherein said opcode describes an opera-
- 20 tion to be performed based upon data included in a packet header so as to facillitate
- 21 lookup of said packet header.
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1           6.     An apparatus as in claim 1, wherein said address includes the address  
2 of a said node in said expanded M-trie data structure that is to be traversed.

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5           7.     An apparatus as in claim 1, wherein said expanded M-trie data  
6 structure includes a set of access control parameters.

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8           8.     An apparatus as in claim 1, wherein said expanded M-trie data  
9 structure includes a set of QoS parameters.

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11           9.     An apparatus as in claim 1, wherein said expanded M-trie data  
12 structure includes a set of CoS parameters.

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14           10.    An apparatus as in claim 1, wherein said nodes include opcodes for  
15 demultiplexing, matching, hashing and other specialized instructions.

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17           11.    An apparatus as in claim 10 wherein said opcodes for demulti-  
18 plexing include instructions to demultiplex into said M-trie plus branches based on the  
19 contents of one or more bytes included in a data packet.

1           12.    An apparatus as in claim 10 wherein said opcodes for demultiplexing  
2 include instructions to demultiplex into said M-trie plus branches based on the contents of  
3 one or more bytes included in a packet header that that is being read.

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5           13.    An apparatus as in claim 10 wherein said opcodes for demultiplexing  
6 include instructions to demultiplex into said M-trie plus branches based on the contents of  
7 one or more bytes included in an IP packet header that that is being read.

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9           14.    An apparatus as in claim 10, wherein said opcodes for matching in-  
10 clude instructions to compare the contents of a byte in the packet label to given node data.

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12           15.    An apparatus as in claim 10, wherein said opcodes for hashing in-  
13 clude instructions to hash into different M-trie plus branches based on the contents of a  
14 byte in said packet header 122.

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16           16.    A method for routing or switching data packets, including steps of  
17 receiving a data packet at an input interface on a router or switch;  
18 looking up information in the header of said data packet in an expanded M-  
19 trie data structure;  
20 terminating said lookup; and  
21 routing said data packet at one or more output interfaces on said router or  
22 said switch.

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2 17. A method as in claim 16, wherein said expanded M-trie data struc-  
3 ture includes a root node, inferior nodes and a terminal node, each node including an ad-  
4 dress and an opcode.

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6 18. A method as in claim 17, wherein said opcode describes an operation  
7 to be performed is based upon data included in a packet header, so as to facillitate lookup  
8 of said packet header.

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10 19. A method as in claim 17, wherein said address includes the address of  
11 a said node in said expanded M-trie data structure that is to be traversed.

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13 20. A method as in claim 16, wherein said expanded M-trie data struc-  
14 ture includes a set of access control parameters.

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16 21. A method as in claim 16, wherein said expanded M-trie data struc-  
17 ture includes a set of QoS parameters.

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19 22. A method as in claim 16, wherein said expanded M-trie data struc-  
20 ture includes a set of CoS parameters.

1           23. A method as in claim 17 wherein said nodes include opcodes for  
2 demultiplexing, matching, hashing and other specialized instructions.

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4           24. An apparatus as in claim 23 wherein said opcodes for demultiplexing  
5 include instructions to demultiplex into said M-trie plus branches based on the contents of  
6 a byte of said packet header that is being read.

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8           25. A method as in claim 23, wherein said opcodes for matching include  
9 instructions to compare the contents of a given byte of the packet label to given node  
10 data.

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12           26. A method as in claim 23, wherein said opcodes for hashing include  
13 instructions to hash into different M-trie plus branches based on the contents of a given  
14 byte in said packet header 122.